

## **JIS College of Engineering**

**(NAAC 'A' Accredited Autonomous Institution)**

### **Syllabus for B. Tech (CIVIL ENGINEERING) 4<sup>TH</sup> YEAR 7<sup>TH</sup> SEM**

**Paper Name: OPERATIONS RESEARCH**

**Paper Code: M (ME) 701**

**Contact: 3L+1T**

**Credits: 4**

### **Course contents**

**Introduction:** Brief history of development of OR; Introduction to different OR problems/ techniques: Decision theory, Linear programming, Transportation and Assignment problems, Network analysis, Sequencing, Project scheduling, Integer programming, Non-linear programming, Inventory control, Queuing or Waiting line problems, Meta-heuristics.

**Decision Theory:** Structure of the problem (decision table); Decision making under uncertainty with optimistic, pessimistic and average outcome criteria; Decision making under risk with expected value and expected loss criteria; Sequential decision using decision trees.

**Linear Programming (LP):** Nature of LP problems through examples; Formulation of LP Problems; Graphical solutions of two decision variable problems; Properties of a solution to LP problems: convex solution space and extreme point solution; General form of LP model; Simplex method and its meaning; Steps of simplex method in tabular form; Solving LP problems by Simplex Method; Sensitivity analysis.

**Transportation & Assignment Problems:** Nature of a transportation or distribution problem; Tabular representation of a transportation problem; North-West Corner initial solution; Stepping stone method; Concept of dummy source or destination; Vogel's approximation method. Nature of an Assignment problem; Tabular representation; Hungarian method for solving assignment problems.

**Network Analysis:** Network models and terminologies like arcs, nodes, paths, tree, spanning tree; shortest path/route problem; The minimum spanning tree problem; The maximal flow problem.

**Waiting line Problems:** Structure of a waiting line System: Single-channel waiting line, process of arrivals, distribution of service times, queue discipline, steady stage operation; Single channel model with Poisson arrivals and exponential service time; Multiple channel model with Poisson

arrival and exponential service times; Single channel model with Poisson arrivals and arbitrary service time (M/G/1); Economic analysis of waiting lines.

**Non-Linear Programming:** Graphical illustration of a non-linear programming problem; Unconstrained optimization by (i) direct search method, (ii) steepest decent method; Constrained optimization by lagrange multipliers; Integer linear programming by branch & bound technique; Dynamic programming problems and their characteristics; Bellman's principle of optimality; solving (i) Stagecoach problem, (ii) Knapsack problem.